SYSTEM AND METHOD OF GENERATING AN OPTIMAL THREE-STEP DEFIBRILLATION WAVEFORM FOR USE IN AN IMPLANTABLE CARDIOVERTER/DEFIBRILLATOR (ICD)

Abstract

Increased myocardial voltage is achieved by configuring a shocking circuit of an ICD to generate a defibrillation pulse waveform having a positive phase with three distinct voltage peaks. The shocking circuit employs three capacitors along with switching circuitry for selectively discharging the capacitors so as to generate the defibrillation pulse waveform. More specifically, the switching circuitry generates a first step of the pulse waveform by discharging the capacitors while connected in parallel, then generates a second step of the pulse waveform by discharging the capacitors while the two of the three capacitors are connected in parallel and the third is connected in series, and finally generates a third step of the pulse waveform by discharging the capacitors while connected in series. By employing a three capacitor shocking circuit configured as described herein, the amount of energy required to reach a myocardial defibrillation threshold is less than for one-capacitor or two-capacitor systems, regardless of the total capacitance of the system. Hence, battery power can be saved and device longevity improved, while still providing effective defibrillation. Moreover, the total amount of time required to reach the defibrillation threshold is less than with one-capacitor or two-capacitor systems, permitting the patient to be defibrillated more quickly. Additionally, the three-capacitor system is generally less influenced by variations in underlying parameters and operating conditions.